Statistics 310 - Fall 2017
Syllabus
Guerra

Statistics 310 is a calculus based introduction to mathematical statistics. The course will cover basic probability and statistical inference, including random variables, probability distributions and models, parameter estimation and hypothesis testing. STAT 310 is largely a mathematical course and homework assignments will reflect the mathematical aspects of statistics. However, you will also be required to complete some data work in order to develop an appreciation for the applications implied by the theory. This course will use the statistical computing package **R**; no previous computing background is required. A weekly topical outline is given below.

Required Materials

- *Mathematical Statistics with Applications in R*, 2nd edition, by Ramachandran and Tsokos, Academic Press, 2015. ISBN-10: 0124171133, ISBN-13: 978-0-12-417113-8. Textbook Website

- **R** Statistical Software, http://www.r-project.org/. It is recommended that you use RStudio, a development environment that helps you organize your work.

Instructor

Dr. Rudy Guerra | 2097 Duncan Hall | Ofc Hrs TTH 4:00-5:00pm & by appt | rguerra@rice.edu

Teaching Assistant

Alejandro Aguilar, alejandro.agular@rice.edu

Course Grade

Your semester grade will be based on homework, a midterm exam and final exam. There will be approximately 6-8 homework assignments. The midterm exam will cover chapters 1-3, 4.1 and the final will cover chapters 4-7. The grade distribution is given below. Partial credit is given on all assignments and examinations. No extra credit work is given.

50%	Homework
20%	Midterm (Thurs, Oct. 12)
30%	Final (Finals Week)

Students may cooperate on homework, but each student must submit his or her own assignment that reflects his or her own thinking, organization, and presentation.

Late Assignment Policy

Each homework assignment will be worth 100 points. Most homework will be due at the beginning of class, 1:00pm, on the due date. No deadline extensions are allowed. Late homework for any reason may be submitted up to 3 days (36 hours) after the due date. Late homework will receive a 10 percentage point deduction per day; the maximum grade attainable for a late assignment is 90%. Late homework begins the minute after I collect the assignment; be sure you understand this policy. Varsity athletes have a responsibility to inform me of exams or assignments that will be missed due to university sponsored travel. Assignments will be collected and returned in class. Submit late homework to the TA, Alejandro Aguilar. Make a copy of your assignment in case it gets misplaced; it can happen.

Classroom Culture: Class attendance is optional and will not affect your grade. However, if you attend class, please adhere to the following requests: silence cell phones; use laptops or ipads **only** for note-taking; leave the Thresher in your backpacks; eat and drink quietly. I interact with students while I lecture and it is therefore a distraction to have students not paying attention. Students using laptops, ipads and cell phones for personal use will be asked to leave the classroom if they wish to use these devices.

Disability Statement: Any student with a disability requiring accommodations in this course is encouraged to contact me after class or during office hours. Additionally, students will also need to contact Disability Support Services in the Ley Student Center.

Strong Advice: The material builds on itself, so keep up and ask for help as we go along or you will seriously struggle. The concepts, nomenclature and mathematical notation of probability and statistics can cause lots of problems for students, often more than calculus for the course. Ask for help early. About 40-50% of each exam is on concepts and basic ideas and results. Although these types of questions do not tend to rely on calculus, many students lose a lot of points on this part of the exam. Be sure you understand the fundamental material.

STAT 310 - TOPICAL OUTLINE FALL 2017*

Week	Topic	Sub-topics	Chapters	Details
1	Statistics and Data	Study design, EDA	1	Framework for inference; sampling; summary stats; plots
2	Probability	Foundations of probability	2.1-2.3	Random events; probability definition; counting
3	Probability	Joint probability, random variable; distribution	2.4-2.5	Conditional probability; independence; Bayes theorem; random variable; distribution and density
4	Probability	Distributions	2.6, 3.2	Moments; mgf; special distributions
5	Random Variables	Joint random variables & Expectation	3.3	Joint distribution; expectation; correlation
			3.4	Functions of random variables
6	Random Variables	Limit Theorems	3.5	Law of Large Numbers and Central Limit Thoerem
	Random Variables	Sampling Distribution	4.1	Sampling distribution; standard error (SE)
7	Inference	Bootstrap	Handout	Empirical distribution function (EDF); Plug-in Principle; Bootstrap for SE
8	Fall Break and Midterm	Midterm on Probability and Random Variables **Thur, Oct 12**		Fall break is Mon-Tues (Oct 9-10). In-class midterm on Thursday, Oct 12. A review will be distributed Thursday, Oct 5.
9	Inference	Sampling Distributions for normal data	4.2-4.4	Normal based sampling distributions (t, chi-squared); order statistics; normal approximation
10	Inference	Point Estimation	5.1-5.3	Point estimation; SE; bias-variance; MSE; method of moments; maximum likelihood
11	Inference	Confidence Interval Estimation	5.5-5.7	Confidence intervals for means and proportions; 1- and 2-sample cases
12	Inference	Hypothesis Testing	6.1, 6.4	Motivation; basic framework; binomial proportion and normal mean
13	Inference	Hypothesis Testing	6.5	Two samples
14	Inference	Hypothesis Testing	7.1-7.3	Categorical data: independence and goodness-of-fit
15	Open Topics			

***Schedule is subject to modification**